Reducing energy use at Faculty of Medicine and Health Sciences Stellenbosch University, South Africa)

Global Green and Healthy Hospitals Agenda Goal:
Energy

Faculty Goal

Over the next 5-years (2008-2013) the faculty should reduce total energy consumption by 20% in order to achieve a reduction in energy costs and the carbon footprint.

Progress Achieved

- Financial benefits: The Faculty was categorized as a Very Large Power User by the national electrical provider Eskom, who have also been rapidly increasing the tariffs for electricity in South Africa and therefore reducing energy use could lead to financial benefits in the long term relative to the cost of making those reductions.
- Developmental benefits: The maximum electrical supply in South Africa is close to maximum availability and load shedding to stay within the available supply is a common event. Load shedding with roving power cuts could be avoided by Very Large Power Users reducing their energy consumption.
- Environmental benefits: Electrical energy in South Africa is almost entirely derived from burning cheap coal and comes with a large carbon footprint. Reducing energy consumption therefore will have a significant impact on the carbon footprint of the Faculty.

The Issue

The Faculty campus consists of 23 buildings, which offer office space, teaching facilities, recreational areas and accommodation for students. The buildings were built in the late 1960s and backlog maintenance was required because of structural safety issues, outdated machinery and equipment. Retrofitting of the buildings to become safer and more up-to-date allowed the Faculty to also address issues of energy efficiency. A preliminary energy audit was conducted in 2008 and found that the annual consumption was 17,258,100kWh and the average maximum demand 3,409.2kVA/month. In 2008 this resulted in a bill of USD $448,815 (R 5,237,808) for electricity.

Sustainability Strategy Implemented

Four areas were identified as being likely to lead to significant savings in energy use: HVAC (Heating, Ventilation & Air-conditioning), Hot water generation, Lighting and Lifts

The central plant HVAC system's design was highly inefficient and had to be operated 365 days a year due to several rooms on campus where medical cadavers were kept for dissection and laboratories that required cooling. The system was not responsive to varying loads in different buildings and could not isolate the individual buildings. The main pump system ran at maximum output regardless of the requirements. Newer more efficient chillers, variable speed pumps and other equipment and systems

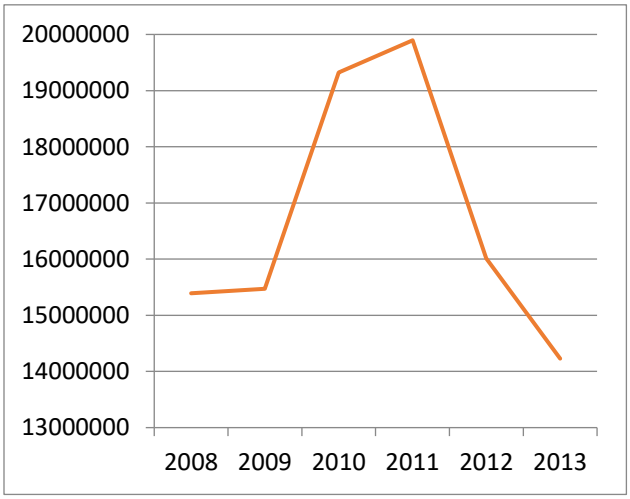
were installed and the system now provides 30% more capacity for between 15-30% less electrical input. Over and above this the system is now able to control the supply of chilled water depending on the demand of each of the individual buildings.

The student accommodation buildings' hot water generation was via wet or dry immersed elements. No solar heating or reclaimed energy was being utilized, and heat pumps needed to be rolled out. An analysis was undertaken and in one of the buildings solar accumulators were installed to supply primary heating for water. In another accommodation facility where up to nine individual water heaters were used, a dedicated large storage plant was coupled to each block cutting total power consumption by 30%. This system can also accommodate heat pumps at a later stage to improve efficiency.

The current lighting in the buildings used old technology such as fluorescent or discharge lighting and did not provide the best light intensity per watt utilization. The majority of the lighting was upgraded internally to more efficient units providing better light intensity. The use of occupancy sensors in some areas such as lobbies was also implemented.

The current lift installation was still of the old two speed control type, which was energy inefficient. Newer systems would analyze demand and control the movement and standby of the cars, thus reducing the length of time and distance a car must operate to answer a call. In low volume times the cars were set to standby and did not become active until the traffic required activation. The new controller employs variable speed drives, which depending on load and speed, could control the amount of electricity required.

The individual distribution boards per floor in the buildings are being equipped with kWh meters so that accurate measurement and management of energy usage can be undertaken with recovery of costs being improved.



Implementation process

The retrofitting of the buildings was contracted out (Drake and Scull was the project manager) and conducted during 2011-2014 under the supervision of the Faculty's facility management team.

Tracking Progress

Progress was monitored by means of measuring the total kWh used and the amount per building. The graph shows total kWh used per year and demonstrates a 28.5% reduction in energy consumption from the high of 2011.

Challenges and lessons learned

Significant energy efficiencies can be easily made through retrofitting of out dated and inefficient equipment. It accepted that in order to reap the benefits of reduced energy consumption a financial and time commitment must be made. This investment will be recovered over a 24-36 month period and thereafter the saving can be attributed directly back to the bottom line. A total expenditure of R35m has been committed to the above interventions

Next Steps

The University have engaged a new energy consultant to look at how further energy efficiencies can be obtained in individual departments. Consideration will be given to solar-voltaic energy use for specific areas such as the computer laboratories.

Demographic information

The Faculty of Medicine and Health Sciences, Stellenbosch University, is situated in Cape Town, South Africa. The campus consisted of 23 buildings with a combined floor area of 58743m2. There are 10 departments that provide teaching to health science students, perform research and provide clinical service.

Links

http://www.sun.ac.za/english/faculty/healthsciences/

Keywords:

Higher education institution, energy saving, energy efficiency, retrofitting

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